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(54) Title: **Apparatus for Transverse Welding and Severing of Parallel Webs or Opposite Wall Portions of a Hose**

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In the Swiss patent document ???587, an apparatus is described which, in the continuous production of packages is used for bonding together opposite wall portions of a wrapper hose by means of a transverse weld seam. This apparatus comprises two counterrotating welding shoes, which engage simultaneously from opposite sides upon these wall portions, thus forming a relatively wide weld seam which, subsequently, is severed in the center by means of a cutting mechanism. Thus, from the original weld seam, two single weld seams are obtained which close off one package at its rear end and the successive package at its front end. It is further known to design the welding shoes in such a manner that, by means of a knife and an anvil surface, which are provided on both welding shoes, the weld seam is severed as it is formed. These apparatus which may be used for welding and severing of parallel webs, dependent on the type of web material, often do not operate in a satisfactory manner. In particular, in case of a very thin sheeting material, difficulties arise which may result in an unsatisfactory product and/or in a breakdown of the packaging operation. Non-coated sheeting made of synthetic material such as polyethylene cannot be treated at all in this manner. The object of the invention is to eliminate these disadvantages. Therefore, it relates to an apparatus for transverse welding and severing of parallel webs or opposite wall portions of a hose with two counterrotating welding shoes which, with every rotation, simultaneously engage upon the inner surface of the wall portions from opposite sides and of which one is provided with a cutter and the other one with a strip-shaped anvil surface facing toward the same. According to the invention, this apparatus is characterized in that at least one of the welding shoes is, because of the force directed radially outward in relation to its rotating axis, movable until it reaches a stopper, in that the distance of the rotating axes is smaller than the sum of the maximum radial distances of the cutter and the anvil surface from the rotating axes, in that the heated welding shoe comprises a wedge-shaped

tapered head, the knife edge of which forms the cutter, in that the other welding shoe comprises on both sides of the anvil surface two reinforcements made of heat-resistant elastic material, in that, when the welding shoes meet one another, the movable welding shoe recedes and the webs or wall portions are first pinched between the reinforcement and a wedge flank, in that then the cut is conducted by the cutter and the anvil surface, in that, finally, by pinching of the webs or wall portions between the other reinforcement and the other wedge flank, a second weld seam is formed.

In the drawing, an embodiment of the invention is represented schematically. It is shown in

Fig. 1 a view of a welding and cutting apparatus,

Fig. 2 a sectional view along line II-II of Fig. 1,

Fig. 3a and 3b are a view in direction of the arrow III of Fig. 1 in two operating phases of an operation cycle which are different from Fig. 2,

and

Fig. 4 a top view of webs welded and cut by means of the apparatus.

The represented apparatus comprises two superposing, counterrotating shafts 1 and 2 to which the welding shoes 3 and 4 are attached. The shoe 3 made of, for example, steel comprises a foot 5, which is partially inserted into an axial groove 6 of shaft 1, and a wedge-shaped tapered head 7 near which an electric heating rod 8 is embedded into the shoe 3. On both sides of the shoe 3 at the foot 5 two cover plates (9) are attached which extend to the head 7 but not to its knife edge 10.

At 11, the welding shoe 4 is secured with the outer ends of two bolts 12, which are movable in diametrical bores 13 of shaft 2. Between the shoe 4 and the shaft 2, a strong compression spring 14 is arranged on each of the bolts 12, the ends of which engage in two depressions 15 and 16 which are designed in the shoe 4 or the shaft 2, respectively. The springs 14 tend to push the shoe 4 away

from the shaft 2 until the heads 17 designed at the bolts 12 hit the shoulders 18 of the bores 13 (see depression in Fig. 3a).

The welding shoe 4 is not heated, although a heating of the same is principally not excluded. At the head end of shoe 4, two preferably outwardly narrowing longitudinal grooves (9) are designed, which hold two rods 20_1 and 20_2 made of heat-resistant synthetic rubber, mostly inserted in it and projecting as reinforcements made of it. Between the two grooves (9), the outer end of the shoe 4 comprises a narrow area strip 21 which, in the position of Fig. 2, is used as the anvil for the knife edge 10 of shoe 3. When the shoe 4 is kept by the springs 14 at its maximum distance from shaft (2), the anvil strip 21 describes a cylindrical surface 22 having the same radius as the cylindrical surface 23 described by knife edge 10. However, segment 24 of cylinder surface 22 which overlaps the cylinder surface 23 cannot be scanned by the anvil strip 21, because this is the point where - and already shortly before and after this point - the welding shoe 4 coincides with the welding shoe 3 and is thus pushed toward shaft 2 by the force of the springs 14.

Immediately underneath the cylinder surface 23 described by the knife edge 10, two superimposed webs 25 made of weldable synthetic material are drawn forward in direction of the arrow 26, for example, by means of a roller pair which is not shown, with a speed which corresponds to the circumferential speed of the knife edge 10. This speed does not necessarily have to be uniform, but may - as is known - vary during one operation cycle, that is during one revolution of the welding shoes 2 and 3. In particular, during the cooperation between the two welding shoes 3 and 4, it may be somewhat less than the average speed.

The described apparatus operates as follows: when the welding shoes 3 and 4, upon movement from the position shown in FIG. 3a approach each other in the direction of the arrows 27, the two webs 25 are eventually pinched between the wedge flank 28_1 of the welding shoe head 7 and the elastically yielding rubber rod 20_1 in

a very gentle manner. The strip-shaped contact point is intensively heated so that the webs 25 are bonded to one another by means of a transverse weld seam 29 (see Fig. 4; first welding phase).

Upon continuing rotation of the welding shoes 3 and 4, the latter reach the position of Fig. 2, in which the knife edge 10 cooperates as a cutter with the anvil surface 21 and cuts the heated webs 25 with one transverse cut 30. For the sake of clarity, the webs 25 are not shown in FIG. 2 and 3b, because it would only overload the drawing without helping the understanding. Fig. 3b shows a second welding phase following the cutting phase in which the wedge flank 28_2 and the rubber bar 20_2 firmly hold the webs, thus forming a weld seam 31.

The use of the above-described apparatus is particularly important for transverse welding and cutting of opposite wall portions of a wrapper hose in the continuous manufacture of packages. The welding and cutting of two parallel webs was chosen as an application example only for the purpose of simpler illustrative representation and because it shows in a simple manner that, instead of two webs, three or more may easily be welded to one another and severed.

With the described apparatus, webs and hoses made of very thin synthetic sheet material may be welded together with which the conventional apparatus of similar kind fail. It is particularly advantageous that the cover plates 9 prevent two much heating of the webs 25 before and after the welding phases and may also hold them down.

In another embodiment, instead of welding shoe 4 the welding shoe 3 could be arranged at the shaft in such a manner that it is radially movable under the compression of the springs. This measure could also be taken with both welding shoes. Instead of springs, pneumatically powered cylinders could be designed to obtain somewhat easier control of the welding pressure according to the material to be treated; this, however, should normally not be necessary.

PATENT CLAIM

Apparatus for transverse welding and severing of parallel webs or opposite wall portions of a hose, with two welding shoes rotating in opposite direction, which engage upon the webs or wall portions with every rotation simultaneously from opposite directions and one of which is provided with a cutter and the other with a strip-shaped anvil surface, characterized in that at least one of the welding shoes (3, 4) is, when a force which is radially directed outward is applied, is in relation to the rotating axis movable until it reaches the stopper (18), in that the distance of the axes is smaller than the sum of the maximum radial walls of the cutter (10) and the anvil surface (21) of the rotating axes, in that a heated welding shoe (3) comprises a wedge-shaped tapered head (7) the knife edge of which forms the cutter, in that the other welding shoe (4) comprises on both sides of the anvil surface (21) two reinforcements (20_1, 20_2) consisting of heat-resistant material, in that, when the welding shoes meet one another, the movable welding shoe (4) recedes and the webs (25) or wall portions are first pinched between a reinforcement (20_1) and a wedge flank (28_1) to form a first weld seam (29), in that then the cut (30) is carried out by the cutter and the anvil surface and in that finally by pinching the webs or wall portions between the other rubber bar (20_2) the other wedge flank (28_2) a second welding seam is formed.

SUBCLAIMS

1. An apparatus according to the patent claim, characterized in that the welding shoe (3) comprising the wedge-shaped tapered head (7) is rigidly connected with a shaft (1) and in that the welding shoe (4) comprising the anvil surface (21) is secured to a bolt (12), which are movable in a diametrical boring (13) of a shaft (2) and which each comprise a head (17), which is held by a compression

spring (14) at a stopper shoulder (18) of the boring as long as the welding shoes do not touch.

2. An apparatus according to subclaim 1, characterized in that the welding shoe (4) comprising the anvil surface (21) is not heated and in that its reinforcements are formed by rubber rods (20_1, 20_2) which are partially inserted into grooves (19).

3. An apparatus according to subclaim 1, characterized in that the maximum radial distance of the anvil surface (21) from its rotating axis is equal to the radial distance of the knife edge (10) from its rotating axis.

4. An apparatus according to subclaim 1, characterized in that the maximum radial distance of the anvil surface (21) from its rotating axis is smaller than the radial distance of the knife edge (10) from its rotating axis, whereby the ratio of both distances is between 0.96 and 0.99.

5. An apparatus according to patent claim, characterized in that the heated welding shoe (3) is provided with cover plates on its both sides, which protect the webs or wall portions from the formation of the first weld seam (28) and after the formation of the second weld seam (31) against the heat coming from the welding shoe.